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U.S. Environmental Protection Agency
Office of Ecosystem Protection
EPA/OEP NPDES Applications Coordinator
5 Post Office Square - Suite 100 (OEP06-03)
Boston, MA 02109-3912

Ref: Gris WWTP Annual Nitrogen Report

To Whom it May Concern:

On behalf of Barnhardt Manufacturing Company, the following report is provided as required by NPDES Permit No. MA0003697 Part 1.B.2 to summarize activities related to optimizing the effectiveness of nitrogen removal methods, documentation of the annual nitrogen discharge load from the facility and a comparison of previous year loads.

The nitrogen removal optimization report required by the NPDES permit was submitted on February 28, 2019. The report concluded that the WWTP was being operated efficiently and in a manner that promoted nitrification. No operational changes that would improve nitrogen removal were identified. However, it was recognized that a large part of the total nitrogen being discharged was related to nitrites and nitrates (NOx) and that levels could be removed using anoxic denitrification. The report noted that this would require capital investments for mixing and control and would also require significant operational changes. No commitment was made to pursue this alternative.

The WWTP continues to be operated in a manner that will promote nitrification. Figure 1 shows concentrations for total nitrogen (TN), Total Kjeldahl Nitrogen (TKN) and NOx for 2019. Based on concentration values, NOx represented around 50% of the TN discharged. Figure 2 shows the effluent concentrations for ammonia (NH_3) and NOx. This demonstrates relatively low concentrations of NH_3 of in the effluent with high concentrations of NOx as a result of nitrification.

The TN effluent loadings for 2019 are shown in Figure 3. The average effluent TN loading for 2019 was 70.1 lbs/day.

A comparison of effluent TN loading is shown in Figure 4 for 2011 through 2019. Loadings for 2019 were higher than for 2018. It should be noted that effluent nitrogen concentrations were historically measured infrequently based on permit requirements. Prior to the current permit,

Figure 1. 2019 Effluent Concentrations for Total Nitrogen, Total Kjeldahl Nitrogen and Nitrite-Nitrate

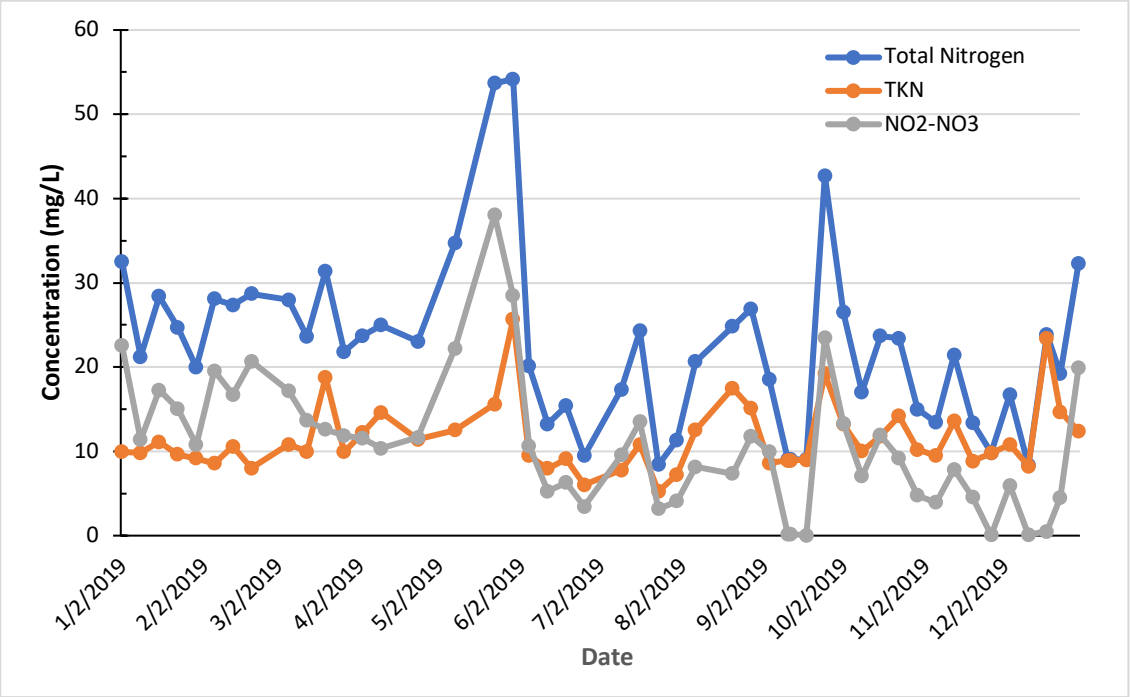


Figure 2. 2019 Effluent Concentrations for Ammonia and Nitrite-Nitrate

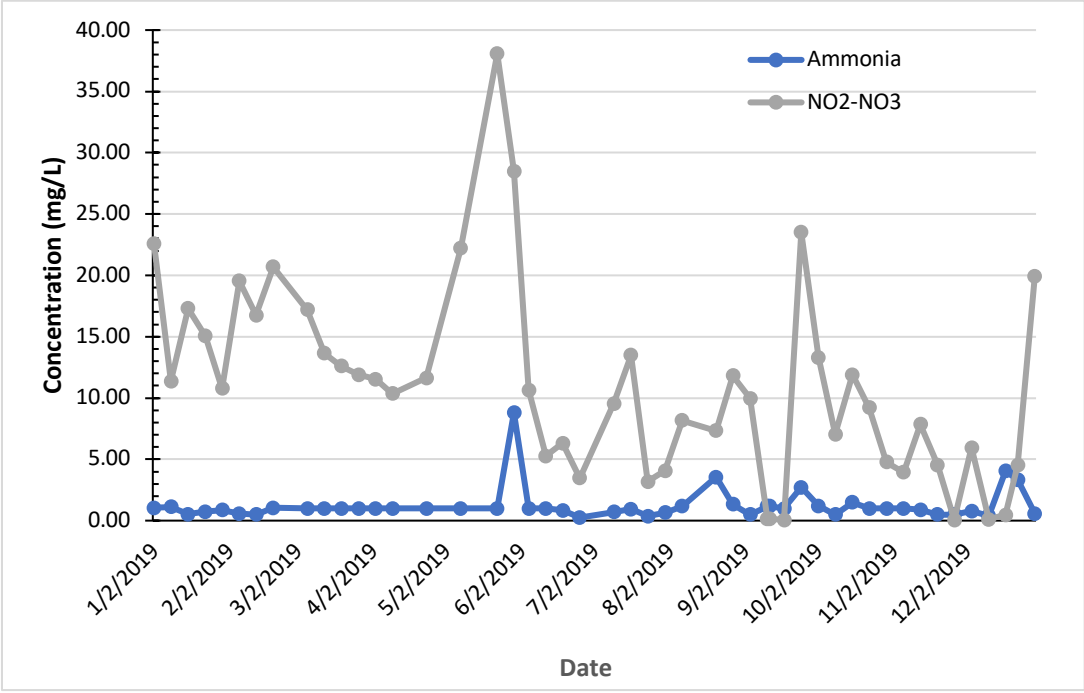


Figure 3. 2019 Effluent Total Nitrogen Loading

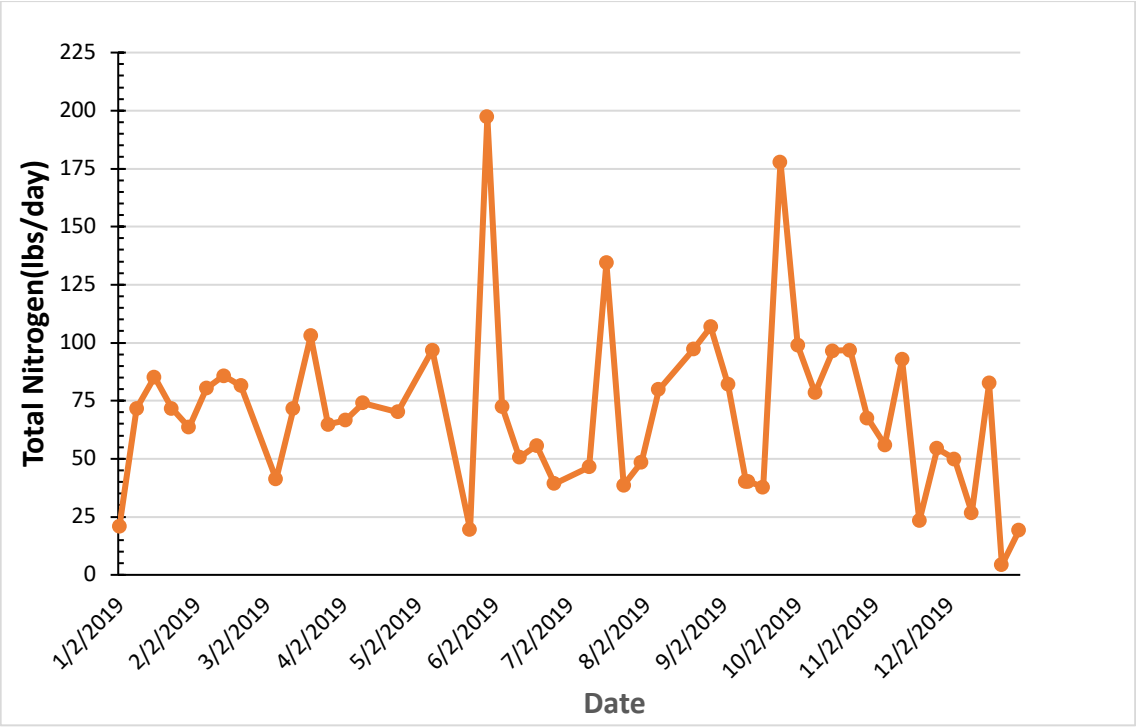
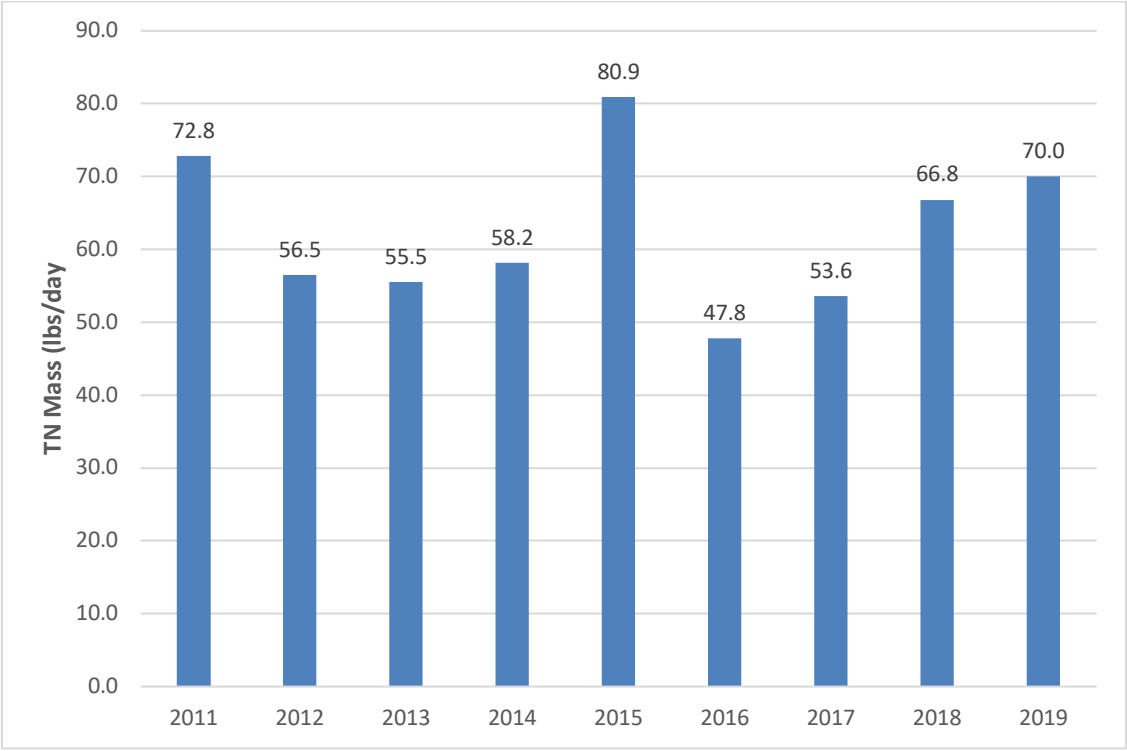


Figure 4. 2011 - 2019 Effluent Total Nitrogen Loading Comparison



nitrogen measurements were made once per month. However, the current permit requires monitoring twice per month for parameters related to TN. Given the variability of the flows and nitrogen concentrations, and the change in testing frequency, the results may not be representative for comparison across the data range presented.

Data used in this report are shown in Appendix A.

As indicated in the optimization report, the source of the nitrogen appears to be the raw cotton and is in the form of organic nitrogen. No chemicals used in processing that contain significant concentrations of nitrogen have been identified.

If you have any questions or need additional information, please feel to contact me or either Mr. Tom Robinson or Mr. Greg Morand at the numbers shown below.

Tom Robinson, Barnhardt Mfg., Phone: 704-376-0380

Greg Morand, Omni Environmental, Phone: 978-256-6766, Ext. 102

Sincerely,

W. Gilbert O'Neal, Ph.D., P.E.
President

Cc: Greg Morand, Omni Environmental Group
Tom Robinson, Barnhardt Mfg.
Lewis Barnhardt, Barnhardt Mfg.

Date	Flow	NO2	NO3	NO2-NO3	NH3	NH3	TKN	Org N	TN	TN
	mgd	mg/L	mg/L	mg/L	mg/L	lbs/day	mg/L	mg/L	mg/L	lbs/day
01/02/19	0.077	0.96	21.60	22.56	1.04	0.67	9.94	8.90	32.50	20.92
01/09/19	0.405	0.58	10.80	11.38	1.12	3.79	9.82	8.70	21.20	71.66
01/16/19	0.360	0.08	17.20	17.28	0.52	1.56	11.10	10.58	28.38	85.18
01/23/19	0.348	0.06	15.00	15.06	0.72	2.09	9.65	8.93	24.71	71.73
01/30/19	0.382	0.18	10.60	10.78	0.86	2.74	9.16	8.30	19.94	63.62
02/06/19	0.343	0.23	19.30	19.53	0.57	1.63	8.57	8.00	28.10	80.38
02/13/19	0.376	0.05	16.70	16.75	0.48	1.51	10.60	10.12	27.35	85.78
02/20/19	0.340	0.18	20.50	20.68	1.03	2.92	8.00	6.97	28.68	81.41
03/06/19	0.177	0.08	17.10	17.18	1.00	1.47	10.80	9.80	27.98	41.21
03/13/19	0.363	0.04	13.60	13.64	1.00	3.03	9.98	8.98	23.62	71.59
03/20/19	0.393	0.71	11.90	12.61	1.00	3.28	18.80	17.80	31.41	102.98
03/27/19	0.356	0.28	11.60	11.88	1.00	2.97	9.94	8.94	21.82	64.78
04/03/19	0.337	0.13	11.40	11.53	1.00	2.81	12.20	11.20	23.73	66.62
04/10/19	0.356	0.07	10.30	10.37	1.00	2.97	14.60	13.60	24.97	74.04
04/24/19	0.365	0.04	11.60	11.64	1.00	3.05	11.40	10.40	23.04	70.21
05/08/19	0.334	0.10	22.10	22.20	1.00	2.79	12.50	11.50	34.70	96.78
05/23/19	0.044	0.27	37.80	38.07	1.00	0.36	15.60	14.60	53.67	19.53
05/30/19	0.436	0.28	28.20	28.48	8.80	32.03	25.70	16.90	54.18	197.23
06/05/19	0.432	0.05	10.60	10.65	1.00	3.60	9.48	8.48	20.13	72.55
06/12/19	0.458	0.09	5.17	5.26	1.00	3.82	7.98	6.98	13.24	50.57
06/19/19	0.433	3.44	2.86	6.30	0.83	3.00	9.09	8.26	15.39	55.63
06/26/19	0.497	0.05	3.41	3.46	0.25	1.04	6.01	5.76	9.47	39.29
07/10/19	0.321	0.09	9.46	9.55	0.69	1.85	7.79	7.10	17.34	46.47
07/17/19	0.663	4.88	8.62	13.50	0.93	5.14	10.80	9.87	24.30	134.38
07/24/19	0.549	0.06	3.12	3.18	0.35	1.60	5.24	4.89	8.42	38.53

Date	Flow	NO2	NO3	NO2-NO3	NH3	NH3	TKN	Org N	TN	TN
	mgd	mg/L	mg/L	mg/L	mg/L	lbs/day	mg/L	mg/L	mg/L	lbs/day
07/31/19	0.513	0.10	3.98	4.08	0.65	2.78	7.25	6.60	11.33	48.51
08/07/19	0.463	0.93	7.23	8.16	1.17	4.52	12.50	11.33	20.66	79.81
08/21/19	0.469	0.44	6.90	7.34	3.54	13.85	17.50	13.96	24.84	97.16
08/28/19	0.476	0.82	11.00	11.82	1.32	5.24	15.10	13.78	26.92	106.83
09/04/19	0.530	0.14	9.83	9.97	0.49	2.17	8.59	8.10	18.56	82.06
09/11/19	0.532	0.02	0.14	0.16	1.17	5.19	8.92	7.75	9.08	40.27
09/12/19	0.532	0.02	0.14	0.16	1.17	5.19	8.92	7.75	9.08	40.27
09/18/19	0.502	0.01	0.03	0.04	1.00	4.19	8.98	7.98	9.02	37.81
09/25/19	0.500	19.90	3.60	23.50	2.72	11.33	19.20	16.48	42.70	177.89
10/02/19	0.447	0.80	12.50	13.30	1.21	4.51	13.20	11.99	26.50	98.89
10/09/19	0.552	0.25	6.79	7.04	0.50	2.30	10.00	9.50	17.04	78.50
10/16/19	0.488	2.88	9.02	11.90	1.49	6.07	11.80	10.31	23.70	96.49
10/23/19	0.496	2.06	7.15	9.21	1.00	4.13	14.20	13.20	23.41	96.75
10/30/19	0.541	0.45	4.32	4.77	1.00	4.51	10.20	9.20	14.97	67.52
11/06/19	0.500	0.49	3.44	3.93	1.00	4.17	9.48	8.48	13.41	55.93
11/13/19	0.518	3.61	4.25	7.86	0.89	3.85	13.60	12.71	21.46	92.71
11/20/19	0.208	1.89	2.66	4.55	0.50	0.87	8.83	8.33	13.38	23.23
11/27/19	0.665	0.02	0.03	0.05	0.50	2.77	9.77	9.27	9.82	54.47
12/04/19	0.357	4.24	1.71	5.95	0.77	2.29	10.80	10.03	16.75	49.89
12/11/19	0.385	0.06	0.05	0.11	0.39	1.25	8.21	7.82	8.32	26.72
12/18/19	0.415	0.40	0.08	0.48	4.04	13.98	23.40	19.36	23.88	82.60
12/23/19	0.026	3.88	0.63	4.51	3.33	0.73	14.70	11.37	19.21	4.24
12/30/19	0.071	17.20	2.72	19.92	0.58	0.34	12.40	11.82	32.32	19.21
Average	0.403	1.53	9.35	10.88	1.24	4.12	11.51	10.26	22.39	70.02
Max	0.665	19.90	37.80	38.07	8.80	32.03	25.70	19.36	54.18	197.23
Min	0.026	0.01	0.03	0.04	0.25	0.34	5.24	4.89	8.32	4.24